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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,321	03/31/2004	Jianping Xu	42P17330	9136

59796 7590 04/07/2008

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EXAMINER	
VAN ROY, TOD THOMAS	
ART UNIT	PAPER NUMBER
2828	

MAIL DATE	DELIVERY MODE
04/07/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/816,321	XU ET AL.	
	Examiner	Art Unit	
	TOD T. VAN ROY	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on *04 February 2008*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9,11-14,20 and 46* is/are rejected.

7)☒ Claim(s) *8,10-11,15,17 and 21* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The Examiner acknowledges the amending of claims 1, 4, 7, 14, and 17.

Response to Arguments

Applicant's arguments with respect to claims 1-21 have been considered but are moot in view of the new ground(s) of rejection.

The Examiner agrees that the current claim limitations distinguish from the previously cited art of Tsai, necessitating withdrawal of the previous rejections.

Claim Objections

Claim 17 is accepted.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-2, 4-5, 7, 9, 14, 16, and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai (US 6735228) in view of Pobanz (US 2005/0147136).

With respect to claim 1, Tsai teaches a method comprising: generating a digital voltage sequence (col.4 lines 16-17), converting the digital voltage sequence to a first current signal (fig.3A Iout) having an adjustable bias mode and modulation mode (via fig.3a #300, adjusted to control inputs), adjusting the bias mode of said first current signal through one or more bias control input (fig.3a #320, adjusts bias current to match control input #324), driving a first laser (fig.3a #LD302) using said first current signal to generate a first optical signal transmission. Tsai does not disclose dynamic adjustment available to select a plurality of bias currents. Pobanz teaches a similar driving circuit wherein an adjustable current source is used to control output to the laser diode (fig.3 [0033]). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the fixed value current sources (Tsai, fig.3a #314,324) with the adjustable current source type of Pobanz in order to allow for adjustment in the driving amplitude of the laser diode as temperature changes and aging occur (Pobanz, [0033]).

With respect to claim 2, Tsai teaches adjusting the modulation mode of said first current signal through one or more modulation control input (fig.3a #310, adjusts bias and mod currents to match control input #314).

With respect to claim 4, Tsai teaches a method comprising: generating a digital voltage sequence (col.4 lines 16-17), converting the digital voltage sequence to a first

current signal (fig.3a Iout) having an adjustable bias mode and modulation mode (via fig.3a #300, adjusted to control inputs), adjusting the modulation mode of said first current signal through one or more modulation control input (fig.3a #310, adjusts bias and mod currents to match control input #314), driving a first laser (fig.3a #LD302) using said first current signal to generate a first optical signal transmission. Tsai does not disclose dynamic adjustment available to select a plurality of modulation currents. Pobanz teaches a similar driving circuit wherein an adjustable current source is used to control output to the laser diode (fig.3 [0033]). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the fixed value current sources (Tsai, fig.3a #314,324) with the adjustable current source type of Pobanz in order to allow for adjustment in the driving amplitude of the laser diode as temperature changes and aging occur (Pobanz, [0033]).

With respect to claim 5, Tsai teaches adjusting the modulation mode of said first current signal through one or more modulation control input (fig.3a #320, adjusts bias current to match control input #324).

With respect to claim 7, Tsai teaches an optical device driver comprising: a buffered level shifter circuit to shift an input voltage to a first voltage level or to a second voltage level (fig.3a #308, high input voltage shifted to VH1, low input voltage shifted to VL1, col.4 lines 40-44), a modulation circuit (fig.3a #306) to generate a first current signal of modulation mode responsive to the input voltage of the first voltage level (mod and bias current signal generated in #310 responsive to first voltage level VH1, fig.3a) and to generate the first current signal of a bias mode responsive to the input voltage of

the second voltage level (bias current signal generated in #320 responsive to second voltage level VL1, fig.3a), a bias control circuit to adjust the bias mode of said first current signal through one or more bias control inputs (fig.3a #320 adjusts bias current to match control input #324), and a modulation control circuit to adjust the modulation mode of said first current signal through one or more modulation control inputs (fig.3a #310 adjusts bias and mod currents to match control input #314). Tsai does not disclose dynamic adjustment available to select a plurality of bias or modulation currents. Pobanz teaches a similar driving circuit wherein an adjustable current source is used to control output to the laser diode (fig.3 [0033]). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the fixed value current sources (Tsai, fig.3a #314,324) with the adjustable current source type of Pobanz in order to allow for adjustment in the driving amplitude of the laser diode as temperature changes and aging occur (Pobanz, [0033]).

With respect to claim 9, Tsai teaches the modulation circuit to comprise: a pMOSFET (fig.4 above IL1 label in #430), a first nMOSFET (fig.4 below Vcc label in #420) and a second nMOSFET (Q507), the modulation circuit to cause the first current signal of the modulation mode to flow from a laser power source (Vcc in #420, "current signal", need not be an actual current source) through the first nMOSFET and second nMOSFET responsive to the input of the laser driver being shifted to the first voltage level (fig.3a in response to first voltage VH1 the first and second nMOSFETs become conductive to the bias current source), and to cause the current signal of the bias mode to flow from the laser power source (Vcc in #430) through the bias control (fig.4 #430)

when another current flows from a second power source (current source #12, above gnd label and #424) through the pMOSFET (Q508 becomes conductive due to the bias applied and the current source would bias the pMOSFET) responsive to the input of the laser driver being shifted to the second voltage level (fig.3a in response to first voltage VL1).

With respect to claim 14, Tsai teaches an optical device driver comprising: a digital electronic interface to transmit a digital voltage input sequence (inherent in order for the sequence to be present), a buffered level shifter circuit to shift an input voltage to a first voltage level or to a second voltage level (fig.3a #308, high input voltage shifted to VH1, low input voltage shifted to VL1, col.4 lines 40-44), a modulation circuit (fig.3a #306) to generate a first current signal of modulation mode responsive to the input voltage of the first voltage level (mod and bias current signal generated in #310 responsive to first voltage level VH1, fig.3a) and to generate the first current signal of a bias mode responsive to the input voltage of the second voltage level (bias current signal generated in #320 responsive to second voltage level VL1, fig.3a), a bias control circuit to adjust the bias mode of said first current signal through one or more bias control inputs (fig.3a #320 adjusts bias current to match control input #324), and a modulation control circuit to adjust the modulation mode of said first current signal through one or more modulation control inputs (fig.3a #310 adjusts bias and mod currents to match control input #314), a laser to generate an optical signal responsive to the first current signal (fig.3a #LD302). Tsai does not disclose dynamic adjustment available to select a plurality of bias or modulation currents. Pobanz teaches a similar

driving circuit wherein an adjustable current source is used to control output to the laser diode (fig.3 [0033]). It would have been obvious to one of ordinary skill in the art at the time of the invention to replace the fixed value current sources (Tsai, fig.3a #314,324) with the adjustable current source type of Pobanz in order to allow for adjustment in the driving amplitude of the laser diode as temperature changes and aging occur (Pobanz, [0033]).

With respect to claim 16, Tsai teaches the modulation circuit to comprise: a pMOSFET (fig.4 above IL1 label in #430), a first nMOSFET (fig.4 below Vcc label in #420) and a second nMOSFET (Q507), the modulation circuit to cause the first current signal of the modulation mode to flow from a laser power source (Vcc in #420, "current signal", need not be an actual current source) through the first nMOSFET and second nMOSFET responsive to the input of the laser driver being shifted to the first voltage level (fig.3a in response to first voltage VH1 the first and second nMOSFETs become conductive to the bias current source), and to cause the current signal of the bias mode to flow from the laser power source (Vcc in #430) through the bias control (fig.4 #430) when another current flows from a second power source (current source #12, above gnd label and #424) through the pMOSFET (Q508 becomes conductive due to the bias applied and the current source would bias the pMOSFET) responsive to the input of the laser driver being shifted to the second voltage level (fig.3a in response to first voltage VL1).

With respect to claims 19-20, Tsai teaches adjusting the modulation, and bias, modes of the current signal is accomplished by setting one or more inputs of the

modulation, and bias, control (modulation and bias currents adjusted via setting of the control inputs #314, and #324 in fig.3a).

Claims 3, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai and Pobanz in view of Feldman et al. (US 5978393).

With respect to claims 3, and 6, Tsai teaches the method of operating the laser driver as outlined in the rejection of claims 1 and 4 above, including use of a digital voltage input, and the adjustment of the input signal into a bias and modulation current modes. Tsai does not teach the input signal to be based on a digital clock signal, or the clock signal to be converted to a current to drive an additional laser diode. Feldman teaches a laser diode driver that uses a digital clock sequence converted to a current to drive a diode (fig.4, note digital to analog converter on clock input to circuit). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the method of Tsai with an additional diode laser to increase transmission capabilities of the system (well known in the art that multiple diodes can be used to provide multiple data outputs), and drive the laser with the converted clock signal of Feldman in order to reduce the amount of noise introduced into the power supply by use of the modulation current (Feldman, cols.9-10 lines 66-6).

Claims 12-13, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsai and Pobanz in view of Bozso et al. (US 2004/0101007).

With respect to claim 12, Tsai teaches the laser driver outlined in the rejection to claim 7, but does not teach the use of CMOS circuits. Bozso teaches a VCSEL driver which uses a CMOS circuit (abs.). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser driver of Tsai with the CMOS circuit of Bozso in order to reduce power consumption when the logic gates are not being switched.

With respect to claims 13, and 18, Tsai teaches the laser driver outlined in the rejection to claims 7 and 14, but does not teach the laser diode to be a VCSEL. Bozso teaches a laser driver which uses a VCSEL. It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser driver of Tsai with the VCSEL of Bozso in order to take advantage of the VCSEL's high coupling efficiency with optical fibers.

Allowable Subject Matter

Claims 8,10-11, 15, 17, and 21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Claims 8 and 15 are believed to be allowable as a laser driver with a buffered level shifter tunable through k+1 control signals to shift a voltage at a controlled rate

with adjustable impedance responsive to a transition of a digital voltage sequence was not found to be taught in the prior art.

Claims 11 and 21 are believed to be allowable as a laser driver with a plurality of capacitors, coupled with a bias control, functioning to reduce a series resistance compared with a termination resistance was not found to be taught in the prior art.

Claims 10 and 17 are believed to be allowable, as the claimed third nMOSFET was not found in the prior art to be used to reduce overshoot of the first claimed current signal.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TOD T. VAN ROY whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/TVR/

/Minsun Harvey/
Supervisory Patent Examiner, Art Unit 2828